



# Energy Use & Impacts Attribute



## Garden Workbook:



**Climate & Sustainability Alliance**

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## Introduction

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**The Energy Use & Impacts attribute** examines how public gardens can reduce fossil fuel energy use and its associated impacts through leadership in green building, energy efficiency, and renewable energy. The growing demands of energy is expected to rise 25% by 2040. Even more alarming, more than 70% of global greenhouse gas emissions are from electricity production. The renewable energy share of total final energy consumption gradually increased, from 16.3 percent in 2010 to 17.0 percent in 2015 and 17.3 percent in 2017. Much faster growth is required to meet long-term climate goals. Global primary energy intensity (the energy used per unit of GDP) improved by 2.2 percent annually, from 5.2 percent in 2015 to 5.0 percent in 2017, but was still short of the 2.7 percent annual rate needed to reach **target 7.3**. Introducing carbon pricing and phasing out fossil fuel subsidies is paramount to ensure a sustainable future. As institutions for research and education, public gardens are instrumental in counteracting these current trends and creating a greener, more resilient future. Public gardens can sustain plant life for future generations without relying on fossil fuels, inspiring those outside garden walls to do the same.

This document lists the Goals and Key Performance Indicators (KPI) that have been identified as standards for gardens' to better address this Attribute in their policy and practice. Please refer to this document as a workbook for what items gardens should try to prioritize (as it makes sense for your gardens needs).

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# United Nations Sustainable Development Goals

The Public Gardens Sustainability Index is intended to share examples of how gardens are contributing to specific SDG goals and to inspire gardens to advance their own garden programs to further the mission of their institution while connecting to local, national, and global sustainability efforts. This Index is a first step guide on how to “get started” with implementing the Sustainable Development Goals (SDGs) from 2015. It aims to help gardens of all sizes and governance models understand the SDG Agenda, to start an inclusive dialogue on SDG implementation, and to prepare SDG-based local or national development strategies (or align existing plans and strategies with the goals).












Public gardens have the opportunity to be more conscious of energy efficiency and finding ways to incorporate renewable energy into their garden infrastructure. Public gardens can sustain plant life for future generations without relying on fossil fuels, inspiring those outside garden walls to do the same.



## Achieving energy decarbonization with universal access

**Entry point**

<b>Lever</b>	<b>Energy</b>	<b>Pathway</b>
		<ul style="list-style-type: none"> <li>Include clear standards and targets for shares of renewable energy in national plans.</li> <li>Mandate and incentivize companies to prepare decarbonization plans.</li> <li>Ensure energy access for all and prioritize needs of those at risk of being left behind.</li> </ul>
		<ul style="list-style-type: none"> <li>Shape spending and taxation policies and subsidies to reduce fossil fuel reliance.</li> <li>Invest in support to workers who lose livelihoods from phasing out fossil fuels.</li> <li>Introduce energy efficiency standards and regulations to reduce consumption.</li> </ul>
		<ul style="list-style-type: none"> <li>Call for energy services that prioritize efficiency and high rates of renewables.</li> <li>Harness media to influence energy use practices at home and in transport.</li> <li>Support youth action and social mobilization for climate action.</li> </ul>
		<ul style="list-style-type: none"> <li>Apply research and development to support infrastructure for key technologies.</li> <li>Implement measures that support wider uptake of existing clean energy technologies.</li> <li>Adopt policies and incentives that encourage investment in technology development.</li> </ul>



United Nations  
Department of Economic and Social Affairs



# Energy Goal 1: Increase reliance on energy efficient and renewable energy programs, systems, and infrastructure, including striving to achieve net zero energy buildings.

Key Performance Indicator (KPI)	Outcomes
<p>a. Garden follows operational standards that guide energy conservation decisions and actions on site.</p> <p>b. Garden develops strategies and supports programs to replace fossil fuel dependent energy sources in new and existing buildings.</p> <p>c. Garden invests in and increases reliance on renewable energy for on-site electricity needs.</p> <p>d. Garden invests in on-site infrastructure, equipment, and technology to improve energy efficiency and reduce Greenhouse Gas emissions.</p>	<p>a. Garden has created energy conservation standards and best practices for all staff to follow with more rigorous training for select staff that are in charge of operations and maintenance.</p> <p>b. Garden has achieved carbon-neutral status.</p> <p>c. Garden greenhouses generate 50% or more of their electricity from a renewable energy source.</p> <p>d. Garden uses energy efficient glass (double panes) at greenhouses and conservatories.</p>

## Suggested Strategies



Develop regular times for frontline staff to report on what facilities and garden areas are requiring the most energy consumption and to check in on use of operational maintenance equipment and possible greener solutions. (Energy.1.a).



Establish procedures and protocols that staff follow to conserve energy on site, particularly for operations and maintenance staff that make daily decisions and need to monitor usage at different facilities. (Energy.1.a).



Perform a complete site analysis of current infrastructure and power output of buildings and determine where renewable energy sources could help lower fossil fuel dependence. (Energy.1.b).



Explore options for renovating or improving energy efficiency of buildings, whether that is through a certification program or bringing a consultant on to review inefficiencies and opportunities for upgrades and investments in newer greener technology. Some local utility companies can provide initial estimates for free and give you an evaluation. (Energy.1.b).




Determine what sources of energy are used most in all facilities and offices. At the end of the month create a summary report on what your meters or utility bills are telling you and find out where energy use is spiking and disseminate that information to your entire staff. (Energy.1.b).



Determine what your peak demand time is for consumption of electricity (when power demand is highest) and when your off-peak time of use is (when power demand is lowest). Some utilities will charge based on their individual customer's peak demand so its best practice to identify and implement a plan to reduce energy consumption during those times. (Energy.1.b).



Invest in and make the switch to renewable energy sources on or off-site for a majority of electricity needs when and wherever possible. (Energy.1.c).

 **Energy Goal 1: Increase reliance on energy efficient and renewable energy programs, systems, and infrastructure, including striving to achieve net zero energy buildings.**

**Suggested Strategies Continued**



Explore your options. Talk to your local utility company and try to source energy from renewable sources and learn about the associated costs. (Energy.1.c).



Reduce on-site fuel consumption in fleet vehicles, lawn mowers, and other equipment through procurement of fuel efficient equipment. Switch to using non-fossil fuel powered equipment in natural lands or conservation areas to reduce GHG emissions and noise pollution. (Energy.1.d).



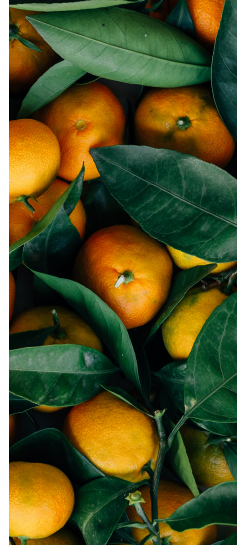
Instead of using lighting to heat plant beds in conservatories and greenhouses, install heated plant beds and rely primarily on sunlight and steam (underground radiators) as main sources for heat. (Energy.1.d).

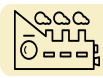


Replace inefficient lighting systems and know where lighting systems stay on the longest. This will help make judgments on where you should put occupancy sensors or vacancy sensors so that lights turn on and off automatically. When compared to an incandescent bulb producing the same amount of light, LEDs are far more energy efficient. (Energy.1.d).



Whitewash (white chemical applied to glass panes) to reduce sunlight and better control the amount of direct sunlight. In greenhouses and conservatories make use of shade cloths/energy blankets. (Energy.1.d).





## Energy Goal 2: Coordinate with local and regional partners to reduce greenhouse gas emissions from energy focused operations.

### Key Performance Indicator (KPI)

a. Garden collaborates with others on clean energy and energy saving programs and initiatives on-site and off-site.

### Outcomes

a. Garden elicits support for renewable energy projects.

b. Garden reaches out to local division of energy management or energy office to explore energy efficiency initiatives or funding to install more energy efficient systems (e.g., HVAC equipment).

c. Garden contracts/agreements with energy companies include rebates/credits for energy efficiency standards met.

d. Garden invests in a green energy purchase option from a utility company or city/municipal green loan program that allows you to borrow the entire cost of a project upfront and pay it back on, for example, energy savings over X amount of years (The Arnold Arboretum is involved in such a program in Boston, MA).

e. Garden supports government or academic energy-related research programs.

f. Garden invests in local waste-to-energy heat recovery and/or clean district energy plants.

### Suggested Strategies



Be a part of green initiatives and sustainability goals that external organizations and institutions have committed to. These kinds of partnerships and signposts of solidarity are great ways to grab the public's attention and show them that sustainability is a priority. Additionally, these commitments help establish project priorities and big picture thinking on how you want your garden to evolve 10, 15, 20 years from now. (Energy.2.a).



While initial costs may be high, strategic partnerships and a demonstrated commitment to energy use reduction may give your garden more exposure as a pioneer and leader in sustainable energy-saving projects in your community and may lead to more collaborative projects and programming in the long run. (Energy.2.a).



Demonstrate to your board and donors how renewable energy could increase revenue and enhance energy efficiency. (Energy.2.a).



Ensure that volunteers and staff that engage the public regularly have the facts and information concerning energy consumption processes at major facilities and attractions. This information should also be part of interpretive signage and programming. (Energy.2.a).

 **Energy Goal 2: Coordinate with local and regional partners to reduce GHG emissions from energy focused operations.**

**Suggested Strategies Continued**



Incentivize people to use renewable energy or reduce fossil fuel reliance through green energy challenges in newsletters, brochures, magazines, and education and interpretation. (Energy.2.a).



Inform the public about larger global commitments like SDG 7 (Clean Energy) and any certifications (LEED) or other ways your garden has contributed to this goal. (Energy.2.a)



Providing information to visitors on how to "make the switch" to renewable energy sources with a local utility company is something that Phipps Conservatory & Botanical Garden does regularly.



Communicate your support for renewable power and the impact it can have on your local community on your website or other media platforms visitors are likely to go to for information on your garden. This could include listing donors and partnerships that demonstrate a commitment to renewable energy programs. (Energy.2.a).







## Energy Goal 3: Track, measure, and monitor energy consumption on all garden owned property

### Key Performance Indicator (KPI)

- a. Garden measures energy used for different purposes on-site.
- b. Garden uses tools and resources to compare energy use on-site with rest of municipality (social responsibility).

### Outcomes

- a. Garden tracks energy performance of commercial buildings and facilities.
- b. Garden tracks fuel consumptions, such as propane, gasoline, or diesel.
- c. Garden uses Energy Star's Portfolio Manager Software to track and compare energy performance against regional or national averages.
- d. Garden collects in-depth data beyond its energy use as monitored by a utility company, conducting internal and thorough energy audits.

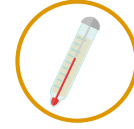
### Suggested Strategies



Evaluate the use of fossil fuel powered equipment in natural lands or conservation areas to reduce GHG emissions and noise pollution. (Energy.3.a).



Conduct an internal energy audit through utility invoices and metering capital projects. Create a tracking system for monthly and annual energy usage to ensure you are meeting your benchmarking goals for energy consumption. (Energy.3.a).



Monitor and track temperature control systems (i.e. HVAC) performance and seek upgrades when and where necessary. (Energy.3.a).



Evaluate which facilities require the most electricity, natural gas, and other forms of energy and then monitor to see if these trends continue (e.g. conservatory-electricity, restaurant-natural gas). (Energy.3.a).



Check meters regularly to monitor kWh and to find outliers and abnormalities. (Energy.3.a).



Install low cost kWh meters that can be linked directly to a central database to monitor and collect data on some of your facilities power output. (Energy.3.a).

# Energy Goal 3: Track, measure, and monitor energy consumption on all garden owned property

## Suggested Strategies Continued



Keep track of how much you are evaluating within your boundaries. If your garden plans to expand, ensure your evaluation and monitoring strategies are adaptable. Revise your monitoring process based on changes in staff size and property owned (expansion). (Energy.3.a).



Conduct an energy audit of plug loads. The following is a great guide on how to do this:  
<http://www.energy.gov.nu.ca/pdf/Plug-Load-Audit.pdf>.  
(Energy.3.b).



Conduct an energy audit of HVAC systems and explore local utility incentives that cover costs to upgrade them. (Energy.3.b).



Track utility and GHG savings in Energy Star Portfolio Manager. (Energy.3.b).



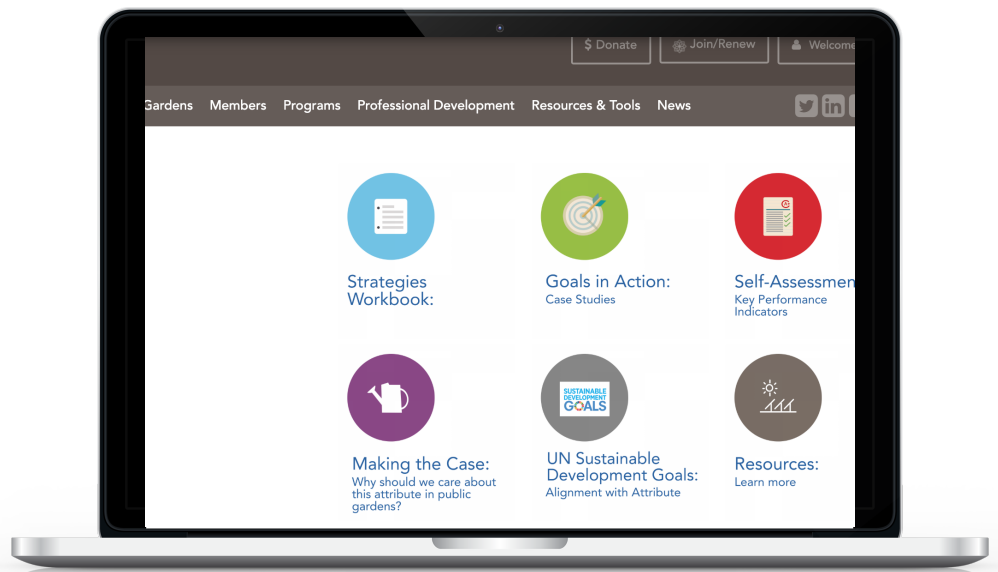
Install and check meters regularly to monitor kWh and to find outliers and abnormalities. (Energy.3.b).



## FOR MORE INFORMATION

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Visit the sustainability index attribute pages for more case studies, resources, and a self-assessment!



<https://www.publicgardens.org/sustainability-index/attributes/energy-use-impacts>

